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NATIONAL DAM INSPECTION PROGRAM. WHITE HERON DAM (MINISINK LAKE--ETC(U)
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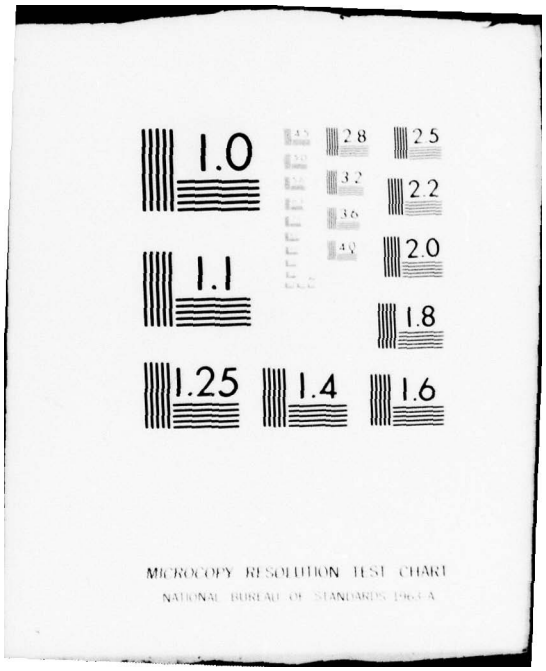
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DELAWARE RIVER BASIN

MARSHALL FALLS CREEK, MONROE COUNTY

PENNSYLVANIA

NDS ID PA. 00636

DER ID 45-116

WHITE HERON DAM (MINISINK LAKE)

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ORIGINAL CONTAINS COLOR PLATES: ALL DDC REPRODUCTIONS WILL BE IN BLACK AND WHITE.

Contract # DACW31-79-C-0017

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

APRIL 1979

(12) 81 p.

DELAWARE RIVER BASIN

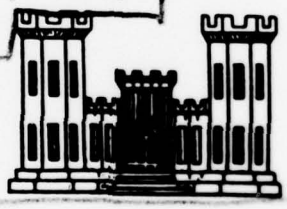
MARSHALL FALLS CREEK, MONROE COUNTY
PENNSYLVANIA

WHITE HERON DAM
(MINISINK LAKE)

NDS I.D. NO. PA 00636
DER I.D. NO. 45-116

(6) PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

National Dam Inspection Program.
White Heron Dam (Minisink Lake),
(NDS ID PA 00636 DER ID 45-116),
Delaware River Basin, Marshall Falls
Creek, Monroe County, Pennsylvania.
Phase I Inspection Report.



(15) DACW31-79-C-0017

Prepared by:

WOODWARD-CLYDE CONSULTANTS
5120 Butler Pike
Plymouth Meeting, Pennsylvania 19462

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Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D. C., 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	White Heron Dam
County Located:	Monroe County
State Located:	Pennsylvania
Stream:	Newton Run
Coordinates:	Latitude 41° 3.5'
	Longitude 75° 7.5'
Date of Inspection:	8 November 1978

White Heron Dam is owned and maintained by the White Heron Association and was constructed in 1929, and completed in the fall of 1930. The dam is considered to be in poor condition and poorly maintained and the spillway is considered to be in fair condition. The dam is classified as a "High" hazard structure consistent with its potential to cause extensive property damage and possible loss of life in the event of failure. The dam is also classified as an "Intermediate" size structure by virtue of its approximately 1,000 acre-foot maximum storage capacity.

The visual inspection revealed significant quantities of clear seepage seeping through and above the downstream toe of the dam. An assessment of the embankment stability could not be performed because of lack of design and construction documentation. Furthermore, the pond drain system could not be inspected as it is either buried in the embankment or under water.

The hydrologic and hydraulic calculations presented in Appendix C indicate that the dam under existing conditions will pass 50 percent of the Probable Maximum Flood without overtopping. Therefore, the spillway system is considered to be "Inadequate".

Based on the findings presented in this report, it is recommended that additional investigations be performed to evaluate the stability of the embankment and seepage through the embankment. These recommendations are presented as follows and should be conducted under the supervision of a registered professional engineer experienced in dam design.

1. Piezometers or observation wells should be installed along the crest and along the downstream slope to determine the location of the phreatic surface.

2. Test borings should be drilled and undisturbed samples retrieved from the embankment and tested to evaluate the physical and engineering properties of the embankment and foundation materials.

3. Data collected in the previous two steps should be evaluated and a stability analysis performed.

Recommendations pertaining to the overall maintenance and rehabilitation of the structure are presented as follows.

1. The downstream slope should be stripped of all vegetation and erosion gullies repaired.

2. Riprap on the upstream slope should be cleared of vegetation and rehabilitated in accordance with recommendations by a registered professional engineer.

3. The pond drain system should be tested and rehabilitated as necessary so as to be operable.

4. Seepage through the downstream toe should be measured and evaluated and remedial measures taken as recommended by a registered professional engineer.

5. The embankment crest should be regraded to design elevation using impervious materials. The materials should be placed in accordance with the recommendations of a registered professional engineer.

Since the facilities do not have a formal procedure of observation and warning during periods of high precipitation, a procedure should be developed and implemented. This would include a method of warning downstream residents when high flows are expected. The Owner should also develop an operation and maintenance procedure, including an inspection checklist, which should be used to regularly inspect and maintain all items of the structure.

25 Apr. 1979

John Boschuk, Jr., P.E.
Pennsylvania Registration 27450E
Woodward-Clyde Consultants

Date

April 25, 1979

John H. Frederick, Jr., P.E.
Maryland Registration 7301
Woodward-Clyde Consultants

Date

APPROVED BY:

19 May 79

G. K. Withers
Colonel, USA
District Engineer

Date

OVERVIEW
WHITE HERON DAM, MONROE COUNTY, PENNSYLVANIA

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
WHITE HERON DAM
NATIONAL ID #PA 00636
DER #45-116

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. White Heron Dam is a 34 foot high earthen embankment with an impervious puddled clay core and a wooden cutoff wall. The 1,450 foot long embankment impounds a 55 acre reservoir with a 614 acre-foot normal storage capacity. The upstream and downstream slopes are 2H:1V from the toe to seven feet below the crest. Thereafter, the slope increases to 1.5H:1V. The average measured crest width is 14 to 15 feet. The minimum width was measured as 10 feet and the minimum crest elevation is 709.8. The downstream slope is covered with grass and the upstream slope is protected with riprap from the crest to elevation 698±. There are no internal drainage systems incorporated in this embankment. A typical embankment section is shown on Plate 3, Appendix E.

Water is normally discharged through the concrete spillway located at the left abutment. The spillway weir is 20 feet long with a crest elevation of 706.

The structure contains two pond drain pipes with gates at the upstream toe. The gate stems extend from the reservoir bottom to just below normal pool level. Water discharges through the two parallel 12-inch cast iron pipes into a small minnow pond at the downstream toe. See Photograph 1.

b. Location. The dam is located on Newton Run in Middle Smithfield Township, Monroe County, Pennsylvania. The dam site is approximately one stream mile upstream of Marshall Falls, Pennsylvania, on Route LR45017 where Newton Run enters Marshall Creek. At the confluence of these two streams, approximately four homes would be affected by the failure of White Heron Dam. The dam site and reservoir are shown on USGS Quadrangle entitled "East Stroudsburg, Pennsylvania" at coordinates N 41° 3.5' W 75° 7.5'. A regional location plan of White Heron Dam and reservoir is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" size structure by virtue of its approximate 1,000 acre-foot maximum storage capacity.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and loss of life at Marshall Falls, Pennsylvania, and farther downstream at Marshall Creek, Pennsylvania.

e. Ownership. White Heron Dam is owned and maintained by the White Heron Association. All correspondence should be sent to Mr. Harold Postel, President, White Heron Association, Post Office Box 54, Marshall Creek, Pennsylvania 18335.

f. Purpose. The purpose of this dam is for recreation.

g. Design and Construction History. The dam was designed by Mr. J. L. Westbrook of Stroudsburg, Pennsylvania, in 1928, for Mr. H. K. Strickler. The application to construct this embankment was submitted on 13 June 1929, and construction began in that same year. The embankment was constructed under the direction of Mr. R. L. Johnson, an employee of Mr. J. L. Westbrook, between 1929 and the fall of 1930.

The original embankment was designed to have a crest width of 12 feet. However, an application was submitted on 21 September 1929, when the dam was partially completed, requesting the crest width to be increased to 20 feet, a roadway placed along the crest, and an increase in height to the present 34 feet.

By July 1929, the cutoff trench and core wall excavation was completed and sufficiently cleaned for drilling and foundation grouting. However, no records could be found confirming that the drilling and grouting was performed.

During the 1929 construction season, several problems existed concerning the quality of fill; the quality of

placement; and the alignment of the timber cutoff wall. During this same period, adverse weather also delayed construction. By the summer of 1930, most of the construction problems were overcome. Records indicate that soil lift thickness was reduced from more than 12 inches to eight inches and compacted with several passes of a ten ton roller. Records also indicate that compaction of at least the upper third of the dam was highly satisfactory.

The dam was completed in the fall of 1930. At about this same time, clear seepage was noted near the right abutment, which corresponds to the location of springs observed during construction. Since then, seepage has constantly flowed from the lower portions of the dam. These seepage areas were confirmed in reports spanning from 1932 through 1965, and confirmed by this latest 1978 field inspection.

The weir section of the spillway was replaced in 1952, in response to the State's direction to install "no-fail" flashboards or a hydraulically efficient weir.

h. Normal Operating Procedures. Reservoir outflow is controlled by the spillway located at the left abutment. Under normal conditions, all water flows through the spillway, under an access road, into Newton Creek, which discharges into Marshall Creek at Marshall Falls, Pennsylvania. The reservoir can be drained by opening the two 12-inch gates at the upstream toe. There are no minimum discharge requirements for this structure.

1.3 Pertinent Data.

A summary of pertinent data for White Heron Lake Dam is presented as follows.

a.	Drainage Area (sq miles)	0.72±
b.	Discharge at Dam Site (cfs)	
	At Top of Dam (existing conditions)	358
	Maximum Known Flood	70 est
c.	Elevation (feet above MSL)(1)	
	Top of Dam	
	Design	710±

(1) Note: Elevations are based on an assumed spillway crest elevation of 706 from USGS Maps.

	Low Point	
	Along Crest	709.8
	Left Abutment	709.7
	Top of Spillway	706
	Pond Drain Inlet	Unknown
	Pond Drain Outlet	Unknown
d.	Reservoir (feet)	
	Length at Normal Pool	2,300
	Fetch at Normal Pool	2,300
e.	Storage (acre-feet)	
	Normal Pool	614
	Top of Dam	1,000±
f.	Reservoir Surface (acres)	
	Normal Pool	55
g.	Dam Data	
	Type	Earth with puddled core and wood cutoff wall.
	Length	1,230± feet
	Height	34 feet
	Crest Width	15± feet
	Slopes	
	From Toe to 7 ft Below Crest	2H:1V
	From 7 ft Below Crest to Top	1.5H:1V
	Cutoff	Cutoff trench and wood core wall.
	Grout Curtain	Required, but installation not confirmed.
h.	Discharge	
	Spillway	
	Type	Concrete weir
	Length	20 feet
	Pond Drain	
	Type	Two 12-inch pipes at base of dam.

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. A summary of engineering data for White Heron Dam is presented in the checklist attached as Appendix A. Principal documents containing pertinent data used for this report include the "Report Upon the Application of H. K. Strickler", dated 13 June 1929, by the State of Pennsylvania, and the "Report Upon the Request of H. K. Strickler", dated 21 September 1929, by the State of Pennsylvania. Other documents included one drawing prepared by Mr. J. L. Westbrook of Stroudsburg, Pennsylvania, dated August 1929. The files also contain several miscellaneous letters, correspondence, memos, construction progress reports, inspection reports and photographs. Available drawings pertinent to this structure are included in Appendix E of this report.

b. Design Features. The principal design features are illustrated on the plan, profile and cross-section plates of the embankment and appurtenant structures enclosed in Appendix E as Plates 2 through 5. A description of the design features is presented in Section 1.2, "Description of Project".

2.2 Construction.

A description of the construction history is presented in Section 1.2. Construction was performed under the supervision of Mr. R. L. Johnson, who worked for the designer, Mr. J. L. Westbrook, of Stroudsburg, Pennsylvania.

2.3 Operational Data.

There are no operational records maintained. There are no minimum flow requirements for the downstream channel. There are no water level measurements or rainfall records maintained within this watershed.

2.4 Evaluation.

a. Availability. All data reproduced in this report and studied for this investigation were provided by DER and supplemented with information supplied by Mr. Frank J. Smith, who represented the White Heron Lake Association.

b. Adequacy. Data included in the State files and verbal information received from the White Heron Lake Association representative were considered adequate to evaluate the spillway and physical dimensions of the dam. There was not sufficient data to evaluate the stability of the embankment or the servicability of the pond drain system. Thus, it is judged that the available data was not sufficient to evaluate the entire structure and appurtenant facilities.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B, and are summarized and evaluated as follows. The dam and its appurtenant facilities were assessed to be in poor condition and marginally maintained.

b. Dam. During the visual inspection, no surface cracks were observed along the crest or the slopes of the dam. There was no evidence observed of recent movement at or beyond the toe, but there was evidence that rock fill was placed along the toe many years ago. It is conjectured that this rock may have been placed to stabilize the embankment as a result of seepage through the toe. This seepage is discussed in more detail below. The horizontal alignment of the crest was checked and no significant distortions were observed. The crest undulates with one significant low point located about 400 feet from the spillway. At this point, the difference between the spillway crest and embankment crest is 3.8 feet. The lowest point along the crest profile is about 60 feet to the left of the spillway. At this point the difference in elevation is about 3.7 feet.

The upstream slope and riprap were checked and found to be in fair condition. The rock showed signs of deterioration. The junctions between the dam and abutments were assessed to be in good condition. The downstream slope is densely vegetated with grasses and woody growth. This vegetation masks possible seepage locations and slope distortion.

Clear seepage was noted along most of the downstream toe with cattails growing along the toe between the dam and the access road. Several other damp elliptical areas were noted near the base of the downstream slope ranging up to 15 feet across and containing fern growth. Several of these elliptical areas are depressed, showing evidence of past movement.

c. Appurtenant Structures. The pond drain system could not be inspected since the entire system is underground or under water. The upstream gate stems are cut off below the water level. The spillway was inspected and observed to be in fair condition, including the bridge crossing the spillway. The downstream channel is in fair condition. The culvert

which carries spillway flow underneath the road is very small, forming a constriction which would not be able to pass large runoff. In the event this channel is clogged or if discharge cannot pass through, water would pass over the road and down into the stream valley below.

d. Reservoir. Reservoir side slopes are flat to moderate and well vegetated with grass and trees. Minimal sedimentation at the upper end has little or no effect on flood water storage.

e. Downstream Channel. As shown on Plate 1, Appendix E, the downstream channel flows through a fairly narrow valley with steep side slopes. The valley is wooded with light underbrush and, in a few locations, the banks have been undercut by stream flow and trees have fallen across the stream.

Approximately 4,000 feet downstream of the dam, Newton Run joins Marshall Creek. At this junction, there are at least four houses subject to damage in the event of high flows or failure of the dam.

3.2 Evaluation.

The results of this Phase I Inspection disclosed that significant seepage has and is continuing to occur through the lower portion of the embankment. This seepage was observed to be clear. Furthermore, a survey of the crest shows that the horizontal alignment was good and that vertical undulations along the crest were one to two feet. Riprap along the upstream slope contains much vegetation and shows signs of deterioration. The downstream slope is heavily vegetated and has possibly masked other zones of seepage.

The pond drain system could not be evaluated since all portions of the system are underground or under water and inaccessible.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures.

Operational procedures are discussed in Section 1.2. Operation of the dam does not require a dam tender. It is reported the pond drains can be operated from a boat and by use of valve extender rods. There are no formal written operation or maintenance procedures for this structure.

4.2 Maintenance of the Dam.

According to the representative of White Heron Lake Association, maintenance to the embankment is limited to periodic mowing of the grass and filling erosion gullies.

4.3 Maintenance of Operating Facilities.

Very little maintenance is ever performed to the pond drain system. It is not known when this system was last exercised or inspected. The spillway is periodically cleaned of debris. It is understood that the discharge channel below the culvert was recently cleared of debris and widened slightly to allow for unobstructed discharge into the creek.

4.4 Warning Systems In Effect.

There are no formal warning systems or procedures established to be followed during periods of heavy rainfall.

4.5 Evaluation.

It is judged that the current operating procedure for this relatively simple dam is satisfactory, provided the pond drain valves can be opened. However, the maintenance procedures are unsatisfactory. Both an operational and maintenance procedure should be developed and formalized. The maintenance procedure should include an inspection and periodic maintenance of the pond drain system.

Since there are no formal warning procedures, it is recommended that a formal procedure be developed so that downstream residents can be warned if high flows or potentially hazardous conditions develop.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. Original design data is limited to statements in the State files evaluating alternate spillway sections. The watershed is small, about 1.5 miles long, and averages 0.7 miles wide, having a total area of 0.72 square miles. Elevations range from a high of approximately 1,700 to the normal pool elevation of approximately 706. The watershed is about 75 percent wooded with little residential development. Residential development is expected to continue within the watershed, but at a slow rate. The weir section was replaced in 1952 in response to the State's direction to install either no-fail flashboards or a hydraulically more efficient weir.

In accordance with the criteria established by the Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard potential classification is the Probable Maximum Flood (PMF). This structure has been classified as "Intermediate" size although sheet 11 of Appendix C shows a maximum capacity of 920 acre-feet under existing conditions. The available flood storage volume was estimated from USGS maps with 20 foot contour intervals. Computer runs, not included, have indicated a total capacity of 1,000 acre-feet if the embankment crest was at 710.67. Therefore, an "Intermediate" size classification has been conservatively maintained.

b. Experience Data. No reservoir water level records or precipitation records are maintained. Tropical Storm Diane, August 1955, was reported to produce a flow of about one foot over the spillway crest. The reported 24 hour rainfall from the Weather Service Publications for the general area was about four inches.

c. Visual Observations. On the date of inspection, there were no conditions observed that would indicate a reduced spillway capacity during a flood occurrence. It is noted that discharge from the spillway passes through a culvert immediately downstream of the spillway apron. The capacity of the culvert is much less than the capacity of the spillway and, as the roadway is higher than the weir, the hydraulic control shifts from the weir to some point downstream. At larger flows, the hydraulic control shifts back to the spillway when the underside of the bridge over the spillway creates an orifice control, at which time, the

embankment is overtopped. As discussed in Section 3.1, a low point to the left of the spillway will overtop first.

d. Overtopping Potential. The overtopping potential of this dam was estimated using the "HEC-1, Dam Safety Version", computer program. A brief description of the program and a summary of the dam safety analysis are included in Appendix C. Calculations for this investigation estimate the peak discharge to be about 358 cfs with the reservoir level at the low point to the left of the spillway. The HEC-1 program computed the peak PMF inflow to be about 2,100 cfs. The spillway just passes 0.5 PMF without overtopping the embankment under existing conditions. It is estimated that the spillway could pass about 0.55 PMF without overtopping if the minimum crest elevation was 710.

e. Spillway Adequacy. The spillway is considered to be "Inadequate" but not "Seriously Inadequate", as the dam will pass 50 percent of the PMF storm under existing conditions without overtopping the embankment.

f. Downstream Conditions. White Heron Dam is located about 4,000 feet above Marshall Falls at the confluence of Newton Run and Marshall Creek. At this location, there are approximately four homes immediately adjacent to Newton Run. About one mile farther downstream along Marshall Creek, there are many homes subject to damage in the event of dam failure. At least one home at Marshall Falls was damaged in 1941, as the result of failure of the flashboards alone. Damage, including loss of life, would be significantly greater if the dam failed during passing of the PMF than damage resulting from high flows just before failure during the PMF.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual observations detected no evidence of deep-seated embankment stability problems. Signs of downslope surface movements were observed, which are probably associated with the long-term seepage through the embankment. As shown on the photographs in Appendix D, the downstream slope contains a considerable amount of undesirable vegetation. The upstream riprap shows signs of distress and deterioration. These observations include rock distortions, downslope movement in several areas and general weathering of the rock.

Uncontrolled clear seepage was noted all along the toe and at several locations above the toe. A detailed discussion is presented in Section 3.

The pond drain system could not be evaluated as it is all under water or buried in the embankment. The spillway was inspected and the structure is judged to be in fair condition, including the retaining walls, weir and bridge.

b. Design and Construction Data. Design documentation was limited. No design calculations were found in the files and only one design drawing was located in DER files. The drawing is presented on the plates shown in Appendix E. The principal features were checked against the construction photographs and, in general, it was found that major components of the dam were constructed as shown on the drawing. Based on analysis of the progress reports and construction photographs, the compaction was poor. It is judged that compaction of the lower portions of the fill would not meet today's design standards, and is probably the principal reason for seepage through the embankment. These photographs and accompanying reports indicate that the compaction effort was poor; the material was placed either too wet or too dry; and lift thicknesses were excessive.

Since stability calculations for this embankment were not available, the stability evaluation was based on assessment of the long-term performance of the embankment, the geometric configuration of the embankment, and an assessment of the materials used for the embankment. This assessment indicates that the cross-section presented in Plate 3, Appendix E, is reasonable for the materials used, but progress reports state the quality of placement was, at best, marginal.

Therefore, the stability may be less than the minimum factor of safety normally accepted by today's standards. Furthermore, the seepage is considered excessive and undesirable and should be monitored. Thus, it is concluded that a series of test borings be drilled and piezometers or observation wells be installed and appropriate engineering analyses performed to evaluate the stability of the embankment. Recommendations are presented in Section 7.

c. Operating Records. There are no operational records for this structure.

d. Post-Construction Changes. Other than replacement of the spillway weir, there are no reports, nor is there any evidence that other modifications were made to this dam.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. Since results of the static stability analysis were not available, an assessment of the seismic stability of the dam could not be performed.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

a. Evaluation. The visual inspection, review of the very limited construction documentation and lack of design data indicates that the dam is in poor condition and appurtenant structures of White Heron Dam are in fair condition. Significant quantities of clear seepage were noted through the embankment, which is either diverted via pipes beneath the roadway or into the minnow pond at the base of the dam. This seepage is undesirable and measures should be taken to monitor and control the flow. The servicability of the pond drain system could not be assessed since it was inaccessible. The only portions of the drain that could be located were two pipe outfalls at the downstream toe just below the water level. An assessment of the embankment stability could not be performed because of the lack of design and construction documentation. Furthermore, there are no internal drainage systems and downstream seepage prevents a judgmental evaluation of the stability based solely on geometry and performance.

The hydrologic and hydraulic computations presented in Appendix C indicate that the dam under existing conditions will pass 50 percent of the Probable Maximum Flood without overtopping. Therefore, the spillway system of this structure is considered to be "Inadequate" but not "Seriously Inadequate".

b. Adequacy of Information. The limited information available for this structure was sufficiently adequate to evaluate the hydrologic and hydraulic aspects of the dam, reservoir and drainage area. There was not sufficient data to evaluate the stability of the embankment or servicability of the pond drain system.

c. Urgency. It is recommended that the recommendations presented in Section 7.2 be implemented as soon as practical.

d. Necessity of Additional Studies. Additional investigations to evaluate the stability of the embankment and seepage through the embankment are presented in Section 7.2.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following measures be taken to evaluate the stability of this embankment. All work should be performed under the direction of a

registered professional engineer experienced in the design of dams.

1. Piezometers or observation wells should be installed along the crest and along the downstream slope to determine the location of the phreatic surface.

2. Undisturbed samples should be taken through the embankment and foundation and tested to evaluate the physical and engineering properties of the embankment and foundation materials.

3. Data collected in steps 1 and 2 should be used to evaluate the stability of the embankment.

Recommendations pertaining to the overall maintenance and rehabilitation of the structure are presented as follows.

1. The downstream slope should be stripped of all woody vegetation and erosion gullies repaired.

2. Riprap on the upstream slopes should be cleared of vegetation and rehabilitated in accordance with recommendations by a registered professional engineer.

3. The pond drain system should be tested and rehabilitated as necessary so as to be operational.

4. Seepage should be measured and evaluated. Appropriate remedial measures, if necessary, should be implemented as recommended by a registered professional engineer.

5. The embankment crest should be regraded to design elevation using impervious materials. The materials should be placed in accordance with the recommendations of a registered professional engineer.

b. Operation and Maintenance Procedures. Because of the location of the dam upstream from the highly populated area of Marshall Creek, Pennsylvania, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning downstream residents. The Owner should also develop an operation and maintenance procedure to be used to insure that the dam is operated in a safe manner and maintained in the best possible condition.

APPENDIX

A

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM *White Heron Lake Dam*

ID # *PA 00636*

ITEM	REMARKS
AS-BUILT DRAWINGS	*None available*
REGIONAL VICINITY MAP	*See Plate 1, Appendix E.*
CONSTRUCTION HISTORY	*See text of report (Section 1.2g) for available information.*
TYPICAL SECTIONS OF DAM	*Availabe sections are presented in Appendix E.*
OUTLETS - PLAN	*See Appendix E.*
DETAILS	
CONSTRAINTS	
DISCHARGE RATINGS	*See Appendix C*
RAINFALL/RESERVOIR RECORDS	*Non Available*

ITEM	REMARKS
DESIGN REPORTS	*None*
GEOLOGY REPORTS	*None*
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	*See Appendix C of report*
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	*No data available*
POST-CONSTRUCTION SURVEYS OF DAM	*None*
BORROW SOURCES	*Unknown*

ITEM	REMARKS
MONITORING SYSTEMS	*None*
MODIFICATIONS	*Installation of present bridge across spillway.*
HIGH POOL RECORDS	*None available.*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*None*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*None*
MAINTENANCE OPERATION RECORDS	*None*

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	*See Appendix E for all available drawings.*
OPERATING EQUIPMENT PLANS & DETAILS	*Not available.*
MISCELLANEOUS	1. *"Application" dated September 29,1925* 2. *"Permit" dated October 14, 1925.* 3. *"Application" dated April 20, 1929* 4. *"Permit" dated July 10, 1929.* 5. *"Report Upon the Application of Harvey Huffman" dated Oct. 7, 1925 by DER* 6. *"Report Upon the Application of H.K. Strickler" dated June 13, 1929 by DE* 7. *Progress Reports and Pennsylvania State Construction Memorandums.*

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam *White Heron Lake Dam* County *Monroe* State *Pennsylvania* National ID # *PA 00636*

Type of Dam *Earth* Hazard Category *I (High)*

Date(s) Inspection *8 Nov. 1978* Weather *Cloudy & Cool* Temperature *40's - 50's*

Pool Elevation at Time of Inspection *705±* M.S.L. Tailwater at Time of Inspection *N/A* M.S.L.

Inspection Personnel:

Mary Beck (Hydrologist) *Raymond Lambert (Geologist)* *John H. Frederick, Jr. (Geotechnical)*

John Boschuk, Jr. (Geotechnical/Civil) *Vincent McKeever (Hydrologist)*

John Boschuk, Jr. Recorder

Remarks:

Mr. Frank J. Smith represented the Owners and provided assistance during the inspection.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	*N/A*	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	*N/A*	
DRAINS	*N/A*	
WATER PASSAGES	*N/A*	
FOUNDATION	*N/A*	

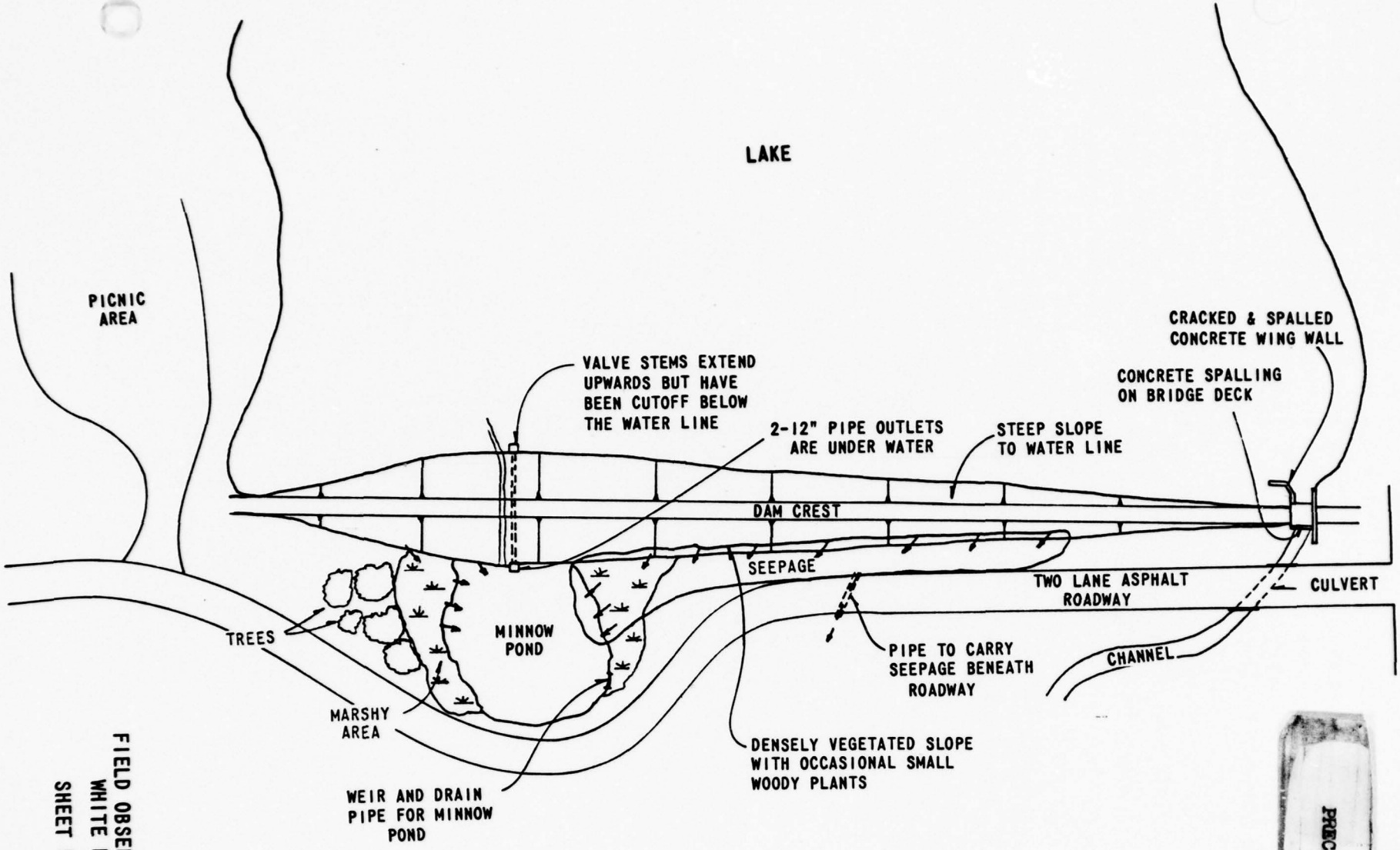
ITEM	REMARKS
MONITORING SYSTEMS	*None*
MODIFICATIONS	*Installation of present bridge across spillway.*
HIGH POOL RECORDS	*None available.*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*None*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*None*
MAINTENANCE OPERATION RECORDS	*None*

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	*None observed.*	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	*Recent significant movements were not observed, however, there is evidence that rock fill was placed along the toe many years ago. Perhaps, this was done to stabilize the seepage noted along the toe.*	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	*There are several damp eliptical areas on the downstream slope ranging up to 15 feet in diameter which contain fern growth. Several of these areas are depressed showing signs of past movement (many years ago).*	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	*The crest undulates vertically but the horizontal alignment is good.*	
RIPRAP FAILURES	*The upstream riprap is in fair condition with signs of deterioration associated with wave action. See photograph in Appendix D.*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	*All junctions are in good condition.*	
ANY NOTICEABLE SEEPAGE	*Yes See Sheet 5a. Seepage was noted along most of the toe and there are cattails growing along the toe between the dam and access road.*	
STAFF GAGE AND RECORDER	*None*	
DRAINS	*None*	



FIELD OBSERVATION PLAN
WHITE HERON DAM
SHEET 5a OF 11

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	*Could not be inspected. All systems are either underwater or embedded in the embankment.*	
INTAKE STRUCTURE	*This structure is located at the upstream toe and the valve stem extends up through the water but has been cut off below the water level. The structure could not be inspected.*	
OUTLET STRUCTURE	*None*	
OUTLET CHANNEL	*See discussion about intake structure.*	
EMERGENCY GATE		

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	*Fair condition with some spalling of weir crest. Flash boards have been used in the past to raise the lake level by about six inches. It was reported that flash boards are no longer used.*	
APPROACH CHANNEL	*The short, shallow approach channel is partially filled with leaves and other debris.*	
DISCHARGE CHANNEL	*Approximately 47 feet downstream of the weir, the discharge channel passes under a road. The size of the entrance is about 25 inches high and averages 7.3 feet wide.*	
BRIDGE AND PIERS	*There is 51 inches clearance between the weir and the girders of the overhead bridge.*	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	*None*	
APPROACH CHANNEL	*None*	
DISCHARGE CHANNEL	*None*	
BRIDGE AND PIERS	*None*	
GATES AND OPERATION EQUIPMENT	*None*	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	*None*	
OBSERVATION WELLS	*None*	
WEIRS	*None*	
PIEZOMETERS	*None*	
OTHER	*None*	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	*The reservoir slopes are moderate. Homes with lawns and trees surround the reservoir.*	
SEDIMENTATION	*There is very little accumulation of sediment in the reservoir which has no effect on flood water storage.*	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	*The downstream channel flows through a fairly narrow valley with steep side slopes. The valley is wooded with light underbrush. There is some undercutting of the banks and fallen trees.*	
SLOPES	*The valley gradient is approximately 0.016.*	
APPROXIMATE NO. OF HOMES AND POPULATION	*Approximately 4000 feet downstream of the dam, Newton Run joins Marshall Creek. There are at least four houses subject to damage in the event of a dam failure.*	

APPENDIX

C

WHITE HERON LAKE DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: *85% wooded, little residential development.*

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): *706 feet (613 Acre-Feet).*

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): *709.7 feet (at left abutment).*

ELEVATION MAXIMUM DESIGN POOL: ---

ELEVATION TOP DAM: *709.8 feet (surveyed low point of dam).*

SPILLWAY

a. Elevation *706 feet.*

b. Type *Trapezoidal weir.*

c. Width *20 feet.*

d. Length ---

e. Location Spillover *Near left abutment.*

f. Number and Type of Gates *None.*

DRAINDOWN FACILITY

a. Type *2-12 inch C.I.P.*

b. Location *Base of embankment.*

c. Entrance inverts *Unknown.*

d. Exit inverts *Unknown.*

HYDROMETEOROLOGICAL GAGES:

a. Type *None.*

b. Location *None Available.*

c. Records *None Available.*

MAXIMUM NON-DAMAGING DISCHARGE: -----

DAM SAFETY ANALYSIS
HYDROLOGIC/HYDRAULIC DATA

Date: 2/22/79
By: MEB
Sheet: 2 of 11

DAM White Heron Lake Dam Nat. ID No. PA.00636 DER No. 45-116

ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1. Min. Crest Elev., ft.			
2. Freeboard, ft.			
3. Spillway(1) Crest Elev, ft.			
3a. Secondary(2) Crest Elev, ft.			
4. Max. Pool Elev., ft.			
5. Max. Outflow(3), cfs			
6. Drainage Area, mi²	0.8		0.72
7. Max. Inflow(4), cfs			2103
8. Reservoir Surf. Area, Acre	58		55
9. Flood Storage(5), Ac-Ft			

Reference all figures by number or calculation on attached sheets:

Example: 3A - Drawing No. xxx by J. Doe, Engr., in State File No. yyyy.

NOTES:

(1) Main emergency spillway.

(2) Secondary ungated spillway.

(3) At maximum pool, with freeboard, ungated spillways only.

(4) For columns B, C, use PMF.

(5) Between lowest ungated spillway and maximum pool.

Date: 2/22/79
By: MFB
Sheet: 3 of 11

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Item (from sheet 2)	Source
6A	letter from State to owner, dated Dec. 14, 1951
8A	memo to State file, dated Jan. 27, 1950
7C	see sheet 10
6C, 8C	USGS Maps East Stroudsburg, PA (1973) Bushkill, PA. (1973)

HEC-1, REVISED
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quandrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputed and flows are routed downstream to the damage center and a dam breach analysis is performed.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.

Classification (Ref- Recommended Guidelines for Safety Inspection of Dams)

1. The hazard potential is rated as "HIGH" as there would be loss of life if the dam failed.

2. The size classification is "INTERMEDIATE" based on its 1000± Ac-Ft total storage capacity.

3. The spillway design flood, based on size and hazard classification is the Probable Maximum Flood (PMF).

Hydrologic / Hydraulic Analysis

1. Original Design Data. Limited to statements in DER files.
   Sept 21, 1929 Report
   Spillway is 20 Ft. x 6 Ft.; 4 ft w/ flash boards in place
   Q w/ flashboards is 530 cfs (700 CSM), considered adequate.
   Sept. 26, 1949, DER letter
   Bridge over spillway reduces dist. between it & weir to 5 ft.
   Jan. 22, 1950 DER memo
   Rated weir to have a coefficient of discharge of 2.6.
   Recommended that no-fail flashboards be placed or a weir installed w/ C = 3.3.
   April 3, 1952, DER memo
   Suggested a 90° weir be installed instead of using flashboards.
   May 19, 1952, letter to DER
   A new weir will be installed. Shape not noted.

2. Evaluation of present structure was by use of the computer program. Computer input data as follows:
   Inflow hydrograph
   rainfall - ref. Hydrometerological Report No. 33
   Snyder's hydrograph parameters, t_p & C_p
   $t_p = C_t (L \cdot L_{ca})^{0.3}$
   $C_t = 1.23$ Information received from Corps of
   $C_p = 0.45$ Engineers, Baltimore District (Zone 1)
   $L = 1.94$ miles } from USGS Maps
   $L_{ca} = 0.63$ miles }

   $t_p = 1.23(1.94 \cdot 0.63)^{0.3} = 1.306$

BY MEB DATE 2/22/79 Rev 9/25/79 SUBJECT White Heron Lake Dam Hydrology / Hydraulics SHEET 6 OF 11

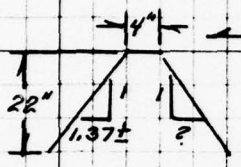
CHKD. BY DATE JOB No.

Reservoir Routing

elevation - storage data, taken from the reported capacity and USGS maps, shown on sheet 9. ✓

elevation - discharge data, shown on sheet 9

a. for heads ≤ 2ft, the hydraulic characteristics of the weir control discharge.



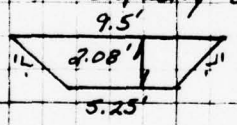
$Q = C L H^{3/2}$ ✓

$C = 3.6$ estimated from Table 5-9, King & Brater, Handbook of Hydraulics ✓

$L = 20$ ft field checked ✓

discharge flows thru downstream culvert, see Photo 6. The road surface is about 4" higher than weir, elevation of the road decreases to the right. When capacity of culvert is exceeded, water flows to the right along the downstream toe until it can flow over the roadway.

capacity of downstream culvert



$n \sim 0.05$ ✓ $S_o \sim 0.056$ ✓ est. from field measurements ✓

use normal depth using Manning's Eq. in the form of $Q = \frac{K}{n} b^{8/3} S^{1/2}$ King & Brater Handbook of Hydraulics

$d = 2.08$

$d/b = 2.08/5.25 = 0.3961$

$K = 3.23$

$Q = 131$ cfs ✓

because water will flow to the right along the toe before capacity of culvert is exceeded and because some heading up on the culvert is possible, assume weir controls discharge from dam until $Q \sim 200$ cfs, or $H = 2$ ft (reservoir level ~ 708). ✓

b. for $2 < H < 4.25$ (reservoir level at 710.25 ft the underside of bridge over spillway)

$Q = CLH^{3/2}$

$C = 2.5$ for road fills, ref. - National Engineering Handbook, Section 4

$L = 20$ ft } in lieu of more
H measured from weir crest } detailed evaluation

c. for $H > 4.25$ ft, when reservoir level is above underside of bridge.

$Q = CA\sqrt{2gH}$ ✓

$A = 4.25' \times 20'$ field measured
$C = 0.6$ ref. Nation Engineering Handbook, Section 4

d. summary of discharge

reservoir elev.	H	Q	type of hydraulic control
706	0	0	} weir control, C = 3.6
708	2	200	} weir, C = 2.5
710.25	4.25	438	}
712.5	4.38	856	} orfice control

Overtopping Potential - as shown on sheet 11, the spillway discharges just over 0.5 PMF

Spillway Adequacy - as the spillway discharges 0.5 PMF but not 1.0 PMF, the spillway is rated as "Inadequate" but not "Seriously Inadequate".

MFB 3/22/79 White Heron Lake Dam
Hydrology / Hydraulics
SH 8 OF 11

```
**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  21 AUG 78
 **********************************

 RUN  DATE* 79/02/22.
      TIME* 06.31.47.
```

WHITE HERON LAKE DAM
NAT ID NO. PA 00636 DER NO. 45-116
OVERTOPPING ANALYSIS

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 4 LRTIO= 1

RTIOS= .50 .70 .80 1.00

MFB 4/22/79 White Heron Lake Dam SH. 9 OF 11
Hydrology /Hydraulics

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
IN	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.80	0.00	.80	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.00	111.00	124.00	134.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.31 CP= .45 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 47 END-OF-PERIOD ORDINATES, LAG= 1.30 HOURS, CP= .45 VOL= 1.00

13.	47.	94.	140.	171.	177.	163.	144.	128.	113.
100.	89.	79.	70.	62.	55.	48.	43.	38.	34.
30.	26.	23.	21.	18.	16.	14.	13.	11.	10.
9.	8.	7.	6.	5.	5.	4.	4.	3.	3.
3.	2.	2.	2.	2.	1.	1.			

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	26.13	23.75	2.38	47344.
										(664.)	(603.)	(60.)	(1340.63)

MFB 4/27/79 White Heron Lake Dam Hydrology / Hydraulics Sh. 10 of 11

HYDROGRAPH ROUTING

OUTFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUT	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-706.	-1

STAGE	706.00	707.00	708.00	709.00	710.00	710.25	712.50	715.00
FLOW	0.00	72.00	200.00	260.00	400.00	438.00	856.00	1000.00
CAPACITY=	0.	614.	1770.					
ELEVATION=	672.	706.	720.					

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
706.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
709.7	0.0	0.0	0.

CREST LENGTH AT OR BELOW ELEVATION	0. 709.7	20. 709.8	770. 710.0	1230. 711.0	1450. 712.0

PEAK OUTFLOW IS 356. AT TIME 44.50 HOURS

PEAK OUTFLOW IS 1033. AT TIME 43.00 HOURS

PEAK OUTFLOW IS 1343. AT TIME 42.50 HOURS

PEAK OUTFLOW IS 1876. AT TIME 41.75 HOURS

MFB 4/12/79 White Heron Lake Dam Hydrology / Hydraulics Sh. 11 of 11

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50	RATIO 2 .70	RATIO 3 .80	RATIO 4 1.00
HYDROGRAPH AT	IN	.80	1	1051.	1472.	1682.	2103.
		(2.07)		(29.77)(	41.68)(	47.63)(	59.54)(
ROUTED TO	OUT	.80	1	356.	1033.	1343.	1876.
		(2.07)		(10.09)(	29.25)(	38.02)(	53.13)(

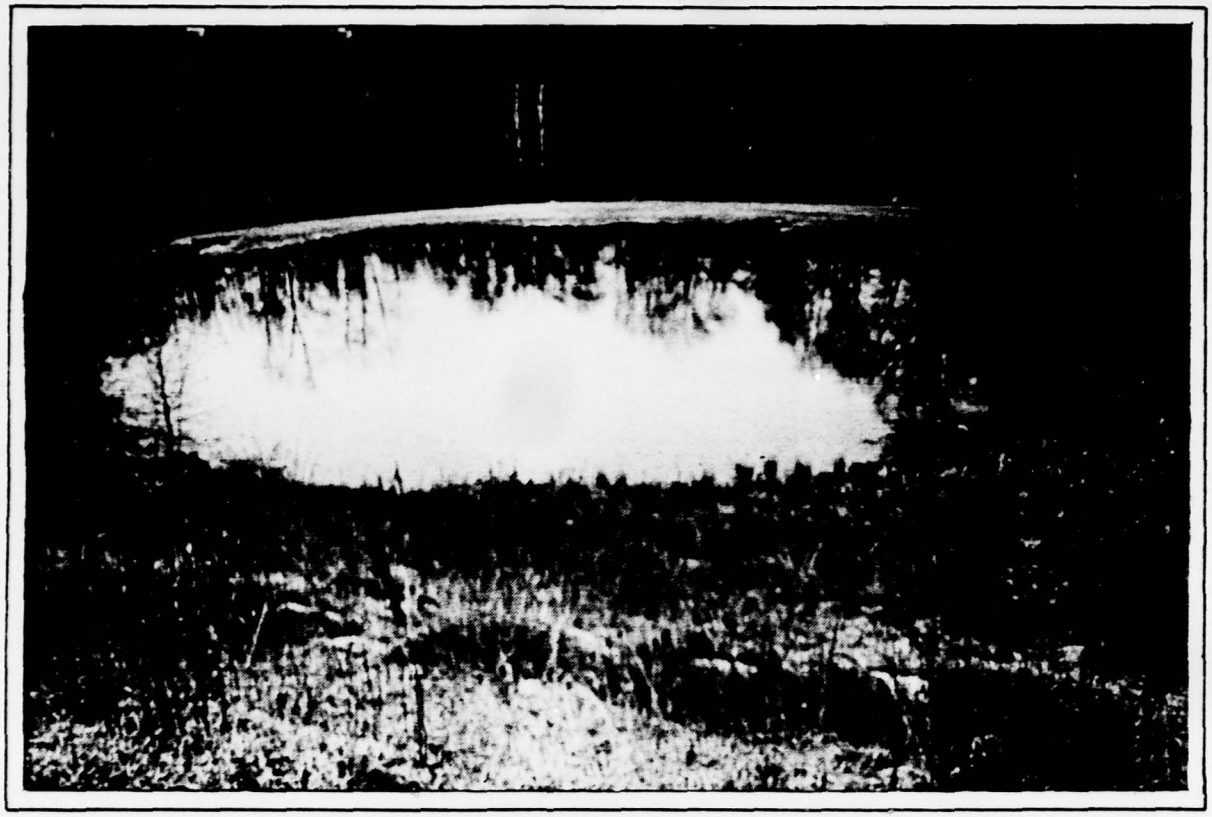
SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	706.00	706.00	709.70
STORAGE	614.	614.	920.
OUTFLOW	0.	0.	358.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	709.69	0.00	918.	356.	0.00	44.50	0.00
.70	710.28	.58	967.	1033.	5.75	43.00	0.00
.80	710.39	.69	977.	1343.	6.50	42.50	0.00
1.00	710.55	.85	990.	1876.	7.50	41.75	0.00

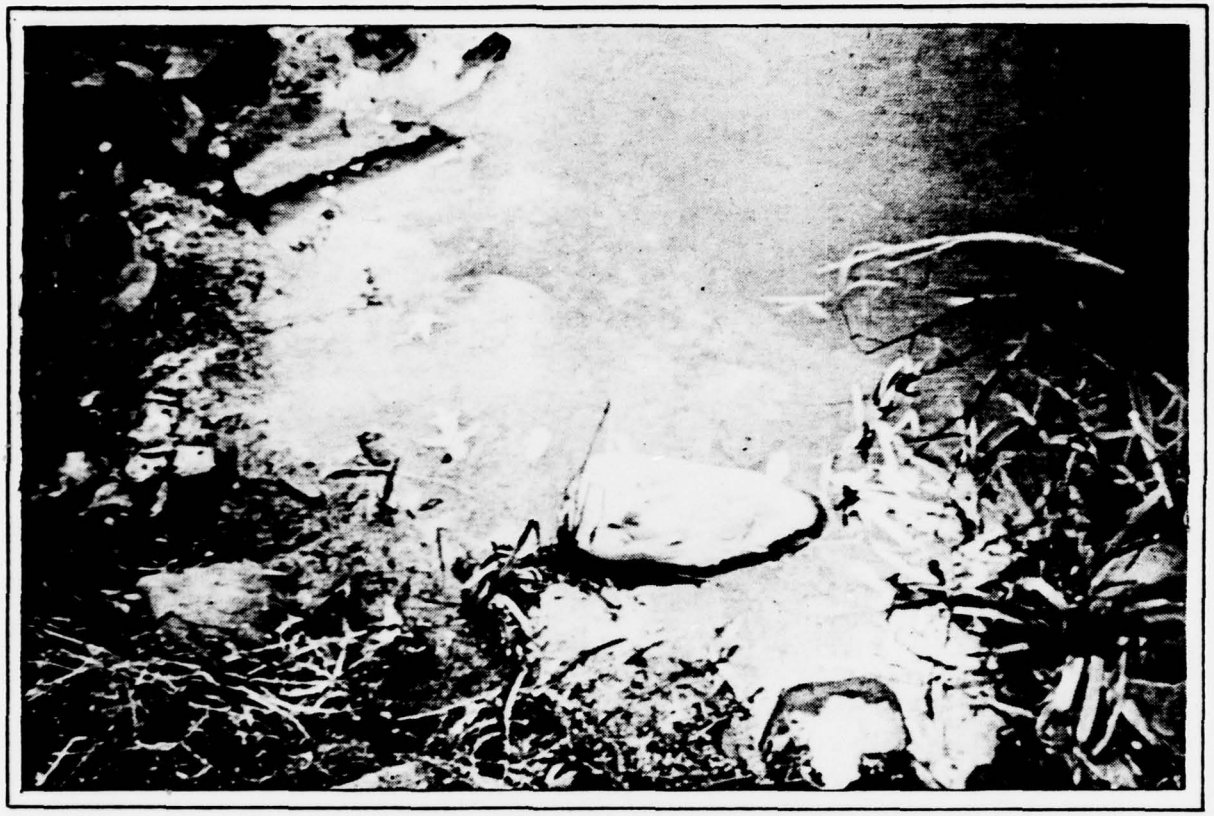
APPENDIX

D



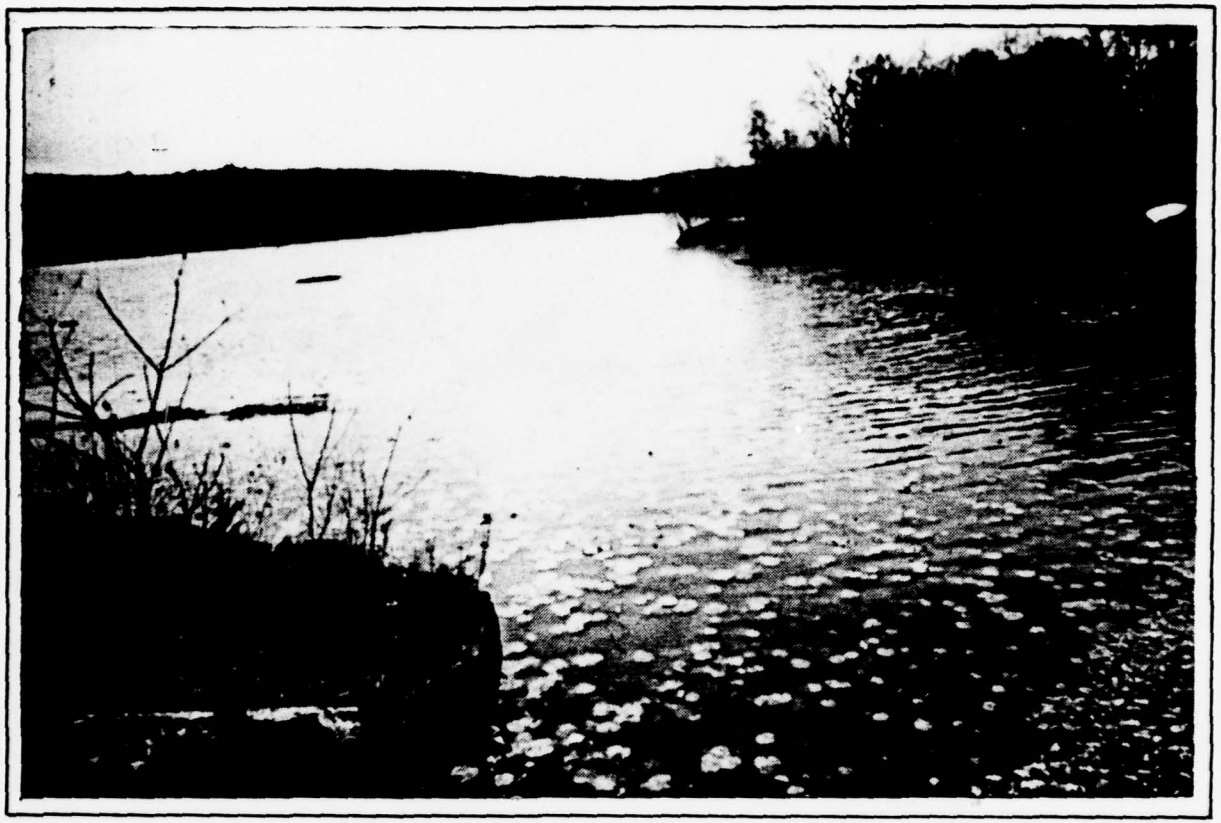
POND DRAIN DISCHARGE AREA. POND
IS LOCATED AT TOE OF DAM.

PHOTOGRAPH NO.1



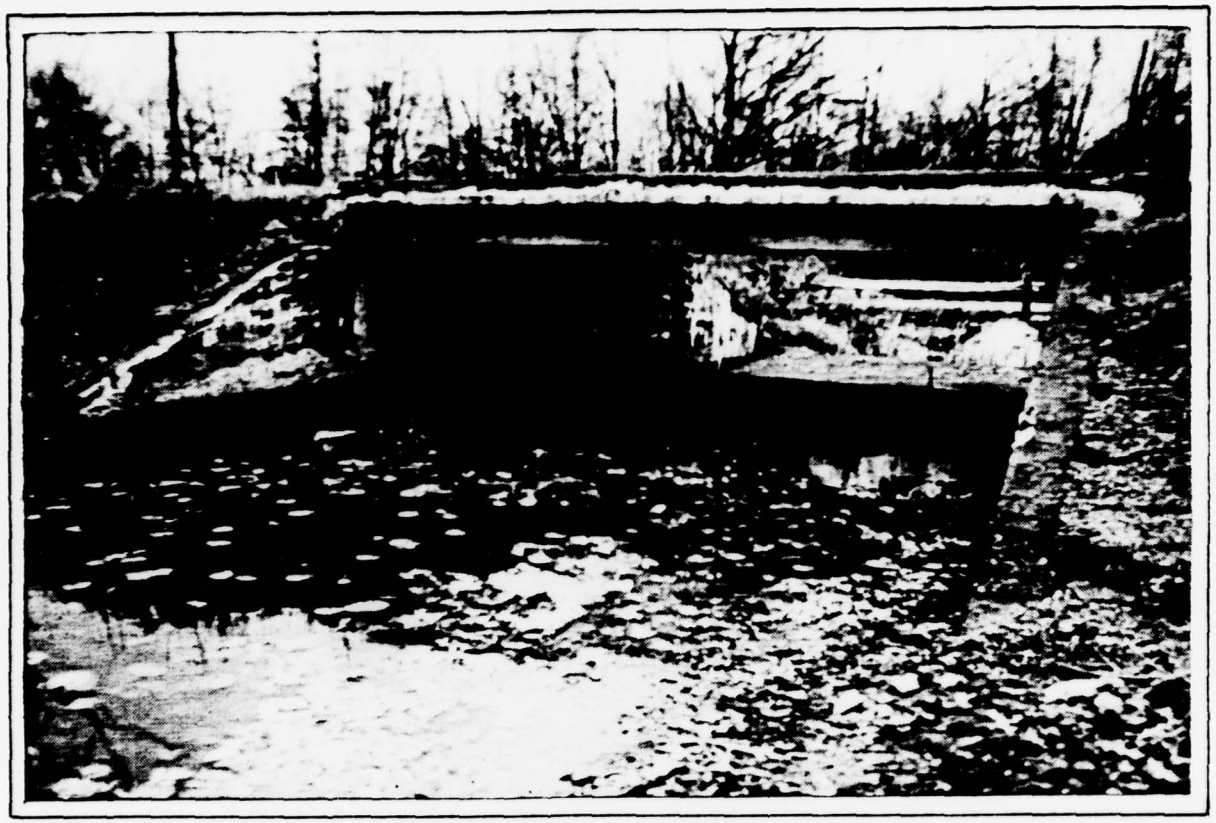
DISCHARGE PIPES AT EDGE OF POND JUST BELOW WATER LEVEL. SEE PHOTOGRAPH 1.

PHOTOGRAPH NO. 2



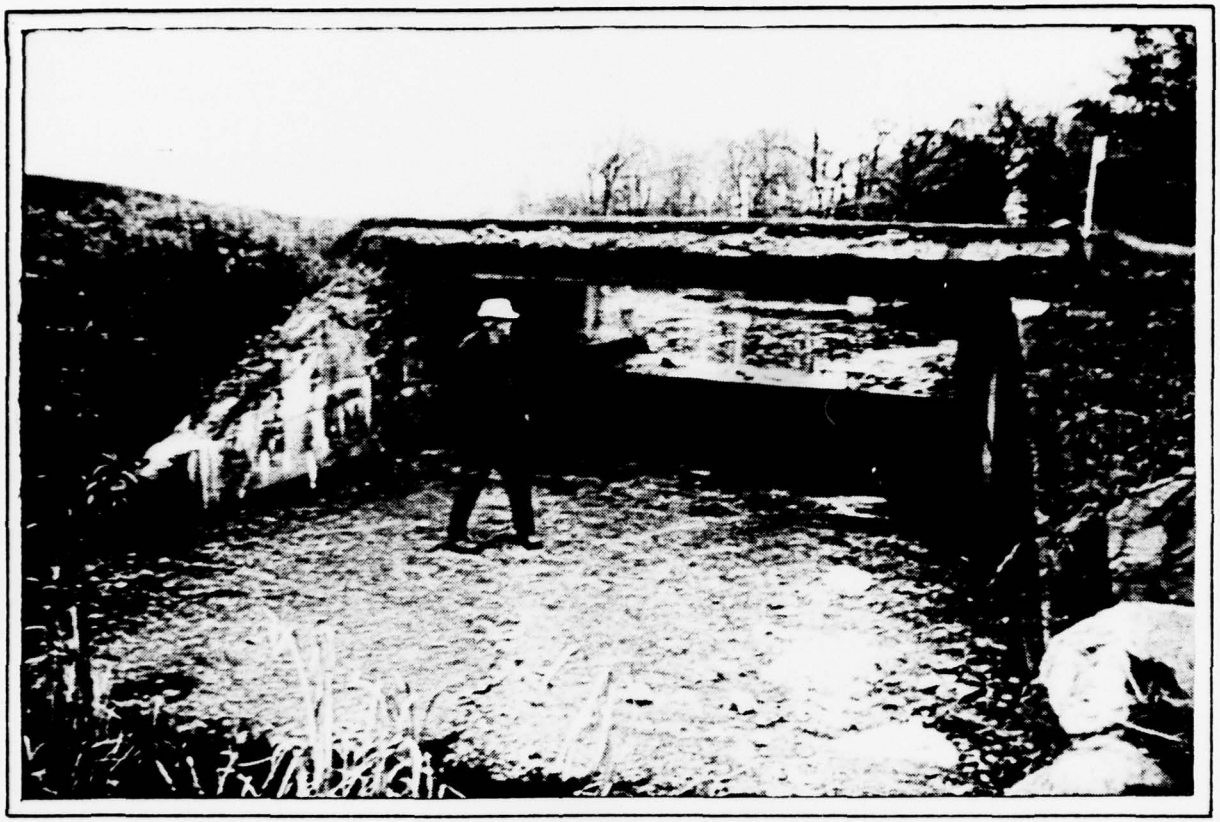
APPROACH CHANNEL TO SPILLWAY
LOCATED AT LEFT SIDE OF DAM.

PHOTOGRAPH NO. 3



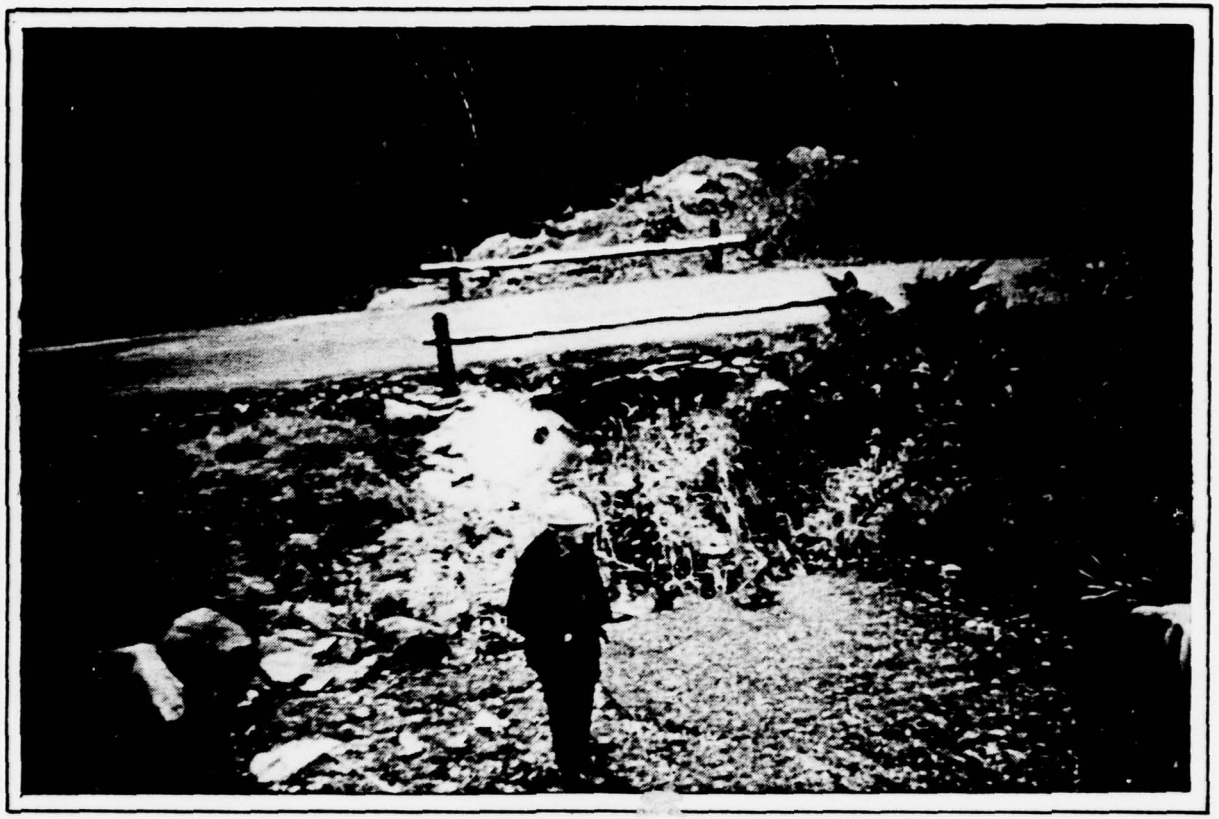
VIEW OF SPILLWAY WEIR AND BRIDGE.

PHOTOGRAPH NO. 4



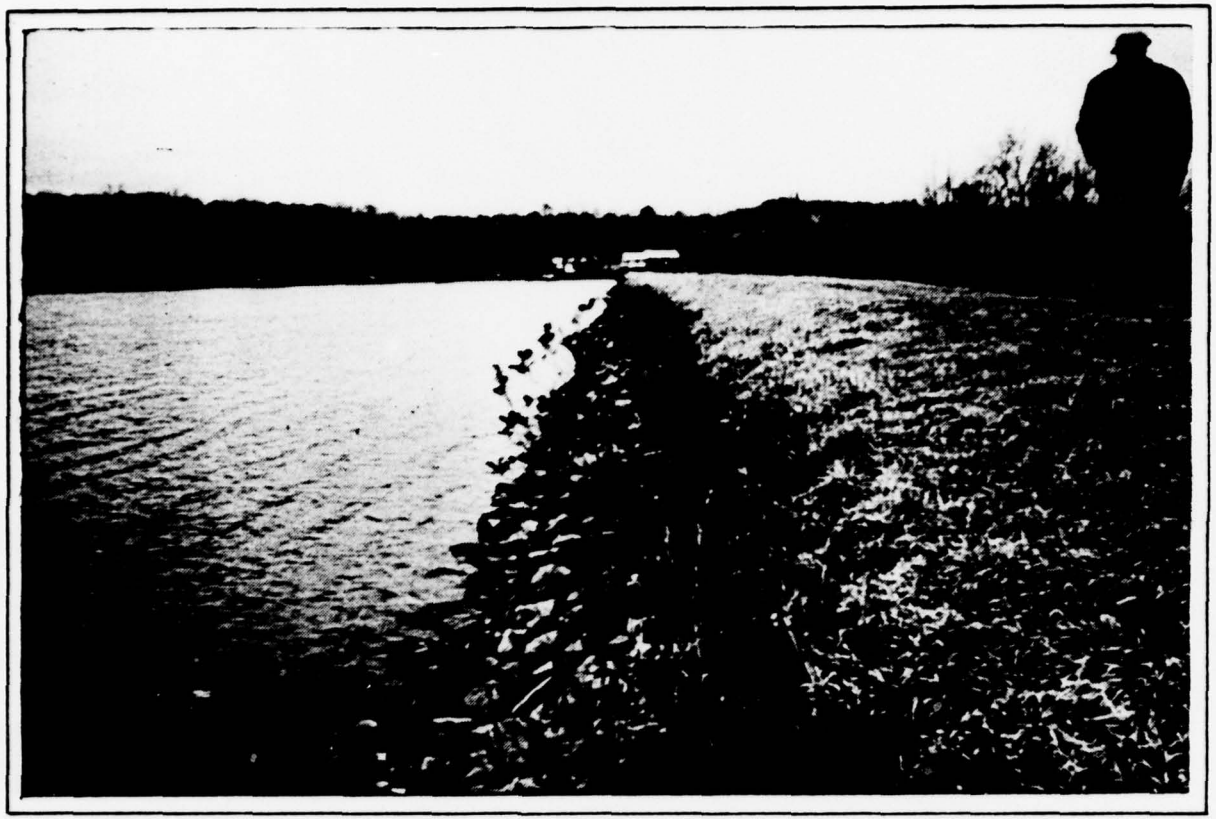
VIEW LOOKING UPSTREAM TOWARDS
SPILLWAY.

PHOTOGRAPH NO. 5



END OF SPILLWAY DISCHARGE CHANNEL.
NOTE THAT FLOW PASSES UNDER ROADWAY.

PHOTOGRAPH NO. 6



VIEW OF UPSTREAM SLOPE LOOKING FROM
RIGHT ABUTMENT.

PHOTOGRAPH NO. 7

VIEW OF DOWNSTREAM SLOPE LOOKING
FROM RIGHT ABUTMENT.

PHOTOGRAPH NO. 8

SEEPAGE ALONG DOWNSTREAM TOE AT
LEFT END OF DAM.

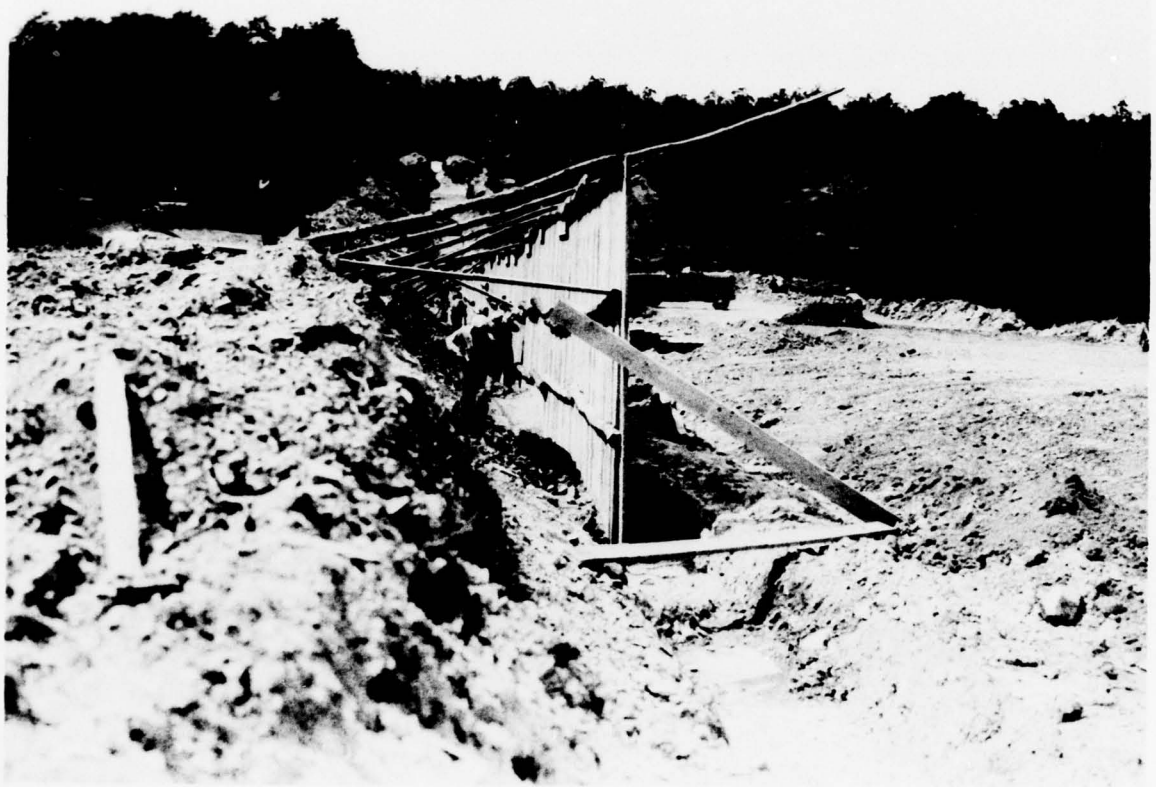
PHOTOGRAPH NO. 9

CLOSE-UP VIEW OF EMBANKMENT SEEPAGE.

PHOTOGRAPH NO. 10

VIEW OF EMBANKMENT SEEPAGE JUST RIGHT OF POND DRAIN OUTLET PIPES. NOTE GENERAL MARSHY CONDITION.

PHOTOGRAPH NO. 11

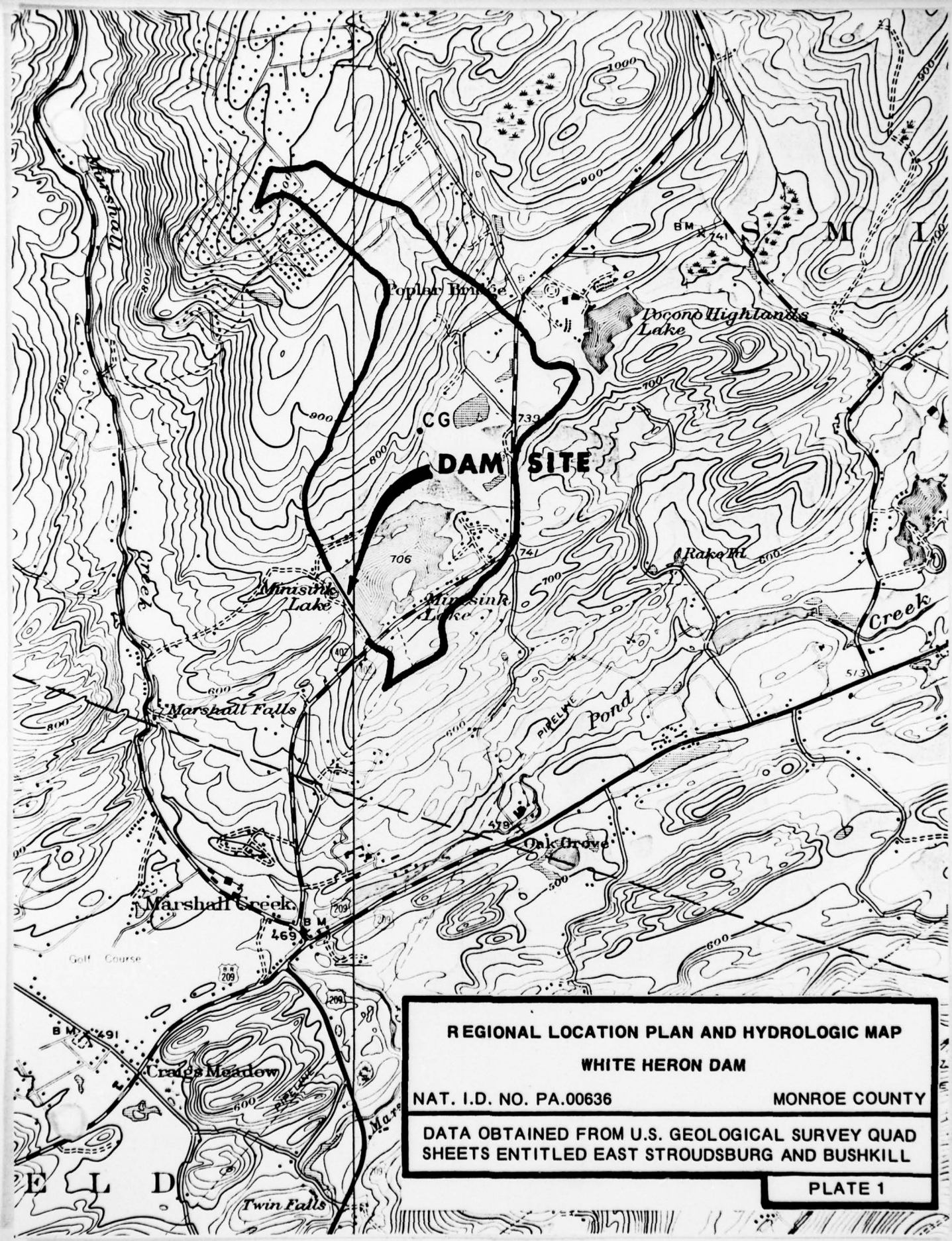


1929 CONSTRUCTION PHOTOGRAPH SHOWING
WOODEN CUTOFF WALL AND BACKFILL
TECHNIQUE.

PHOTOGRAPH NO. 12

APPENDIX

E



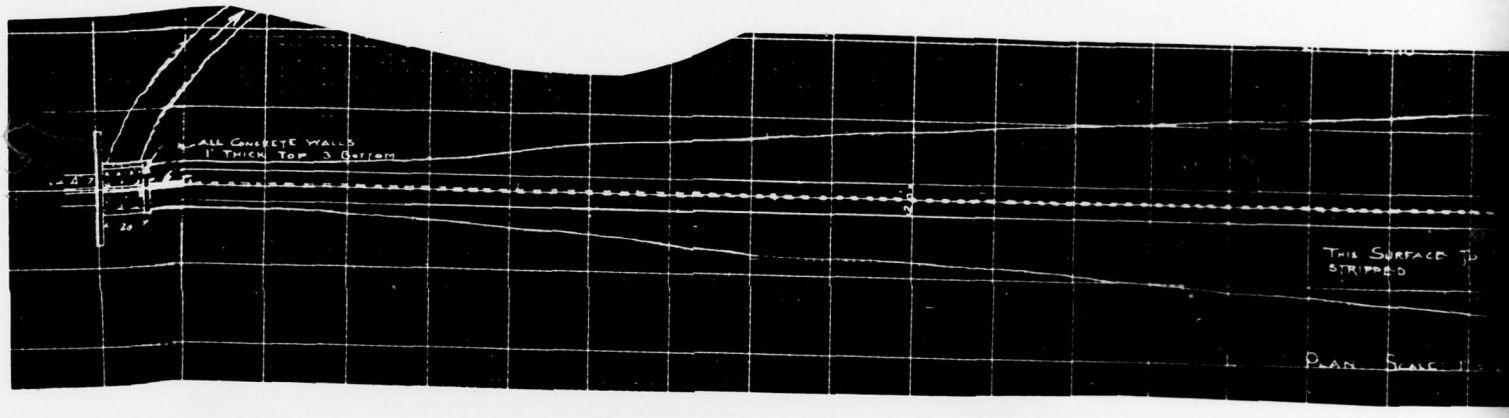
REGIONAL LOCATION PLAN AND HYDROLOGIC MAP

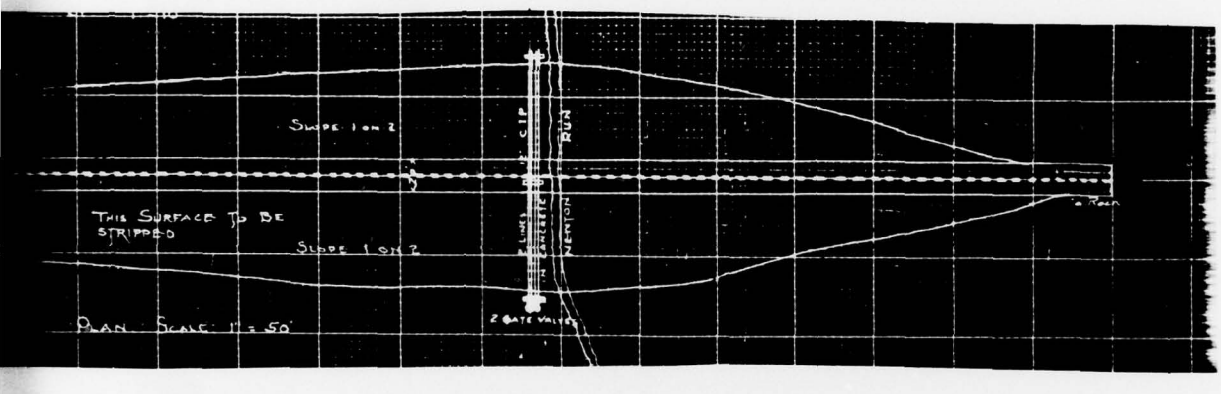
WHITE HERON DAM

NAT. I.D. NO. PA.00636 MONROE COUNTY

DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD SHEETS ENTITLED EAST STROUDSBURG AND BUSHKILL

PLATE 1


ALL CONCRETE WALLS
1' THICK TOP & BOTTOM
THIS SURFACE TO
STRIPPED
PLAN SCALE

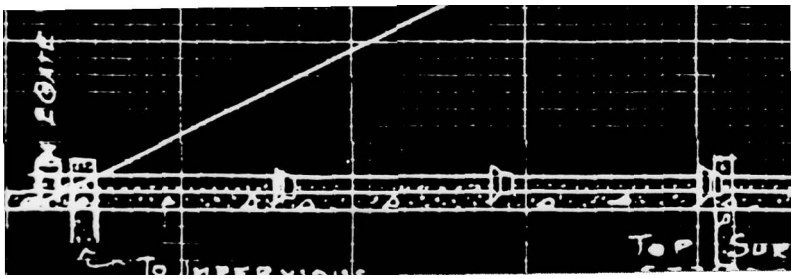


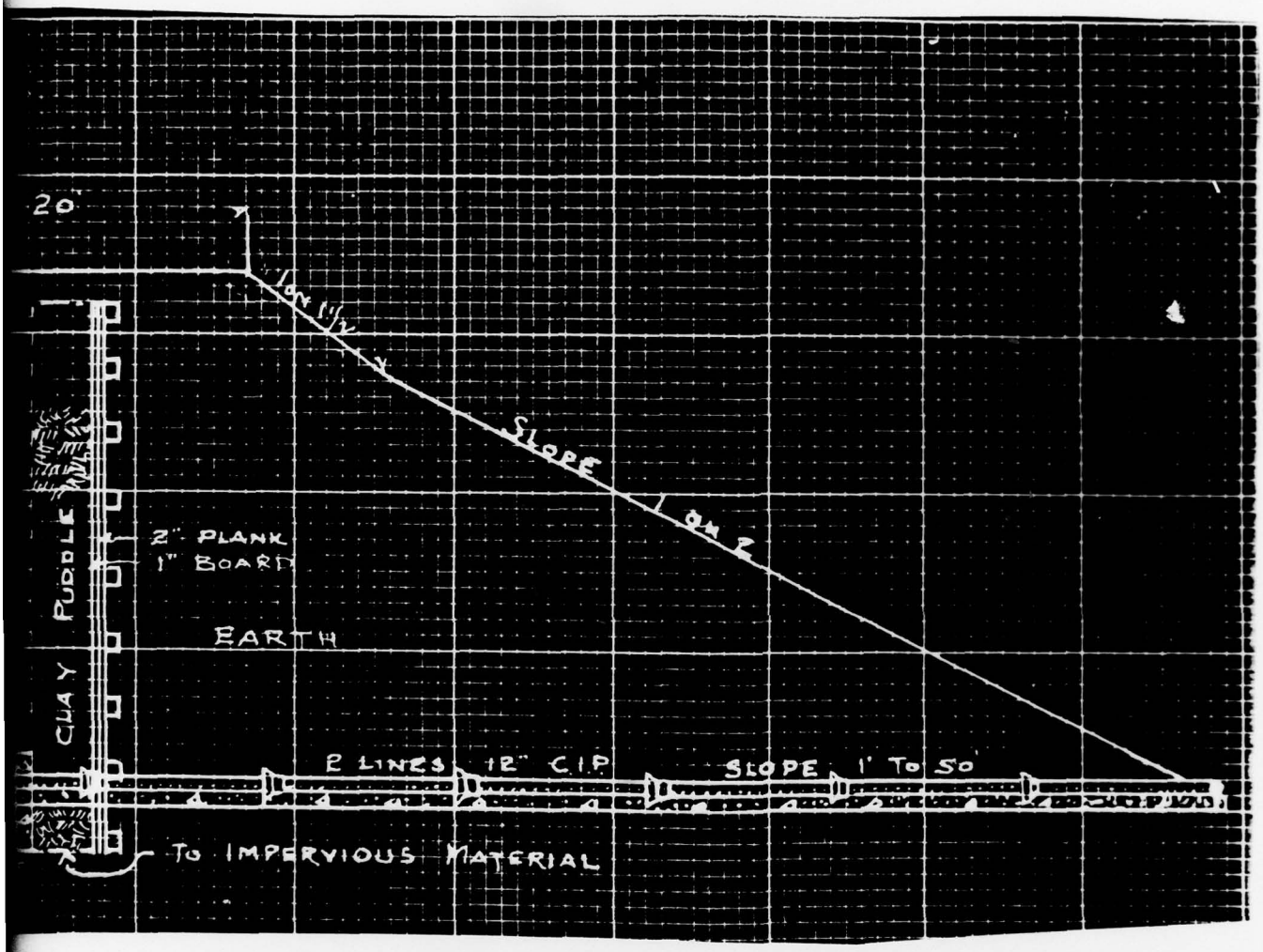
PLAN OF DAM AND APPURTENANT STRUCTURES
WHITE HERON LAKE DAM

NAT. I.D.NO.PA.00636 MONROE COUNTY

DATA OBTAINED FROM J.L.WESTBROOK, CIVIL ENGINEER STROUDSBURG, PA. , DATED AUGUST 1929

PLATE 2



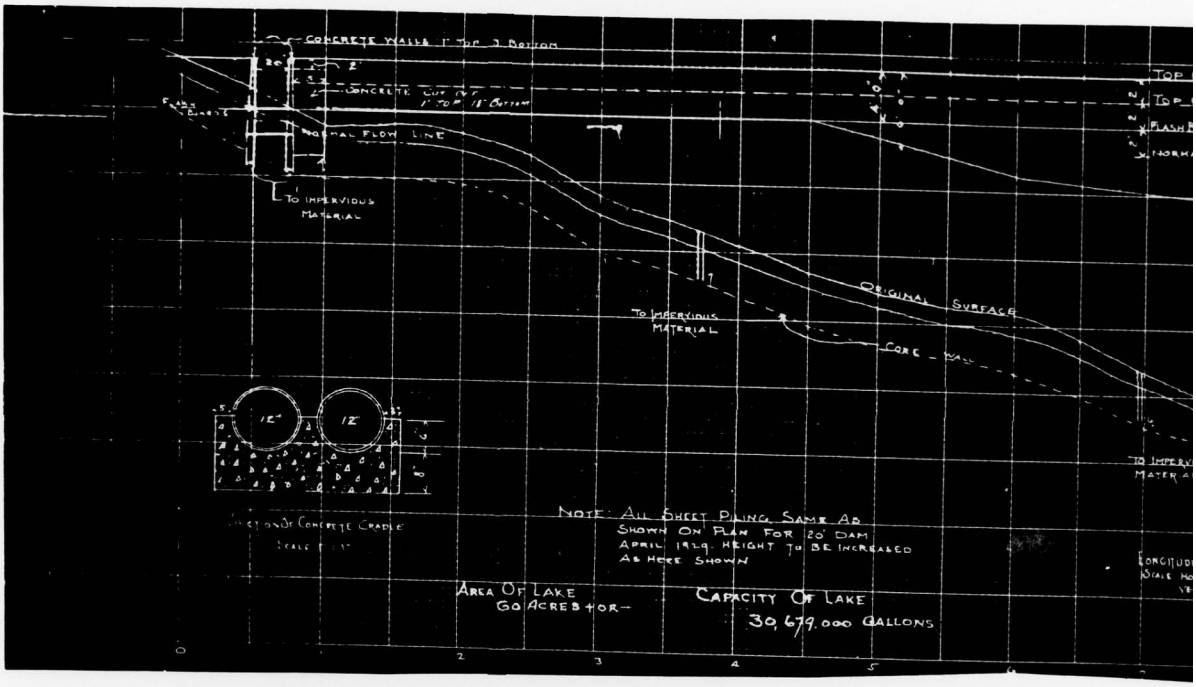


TYPICAL EMBANKMENT SECTION
WHITE HERON LAKE DAM

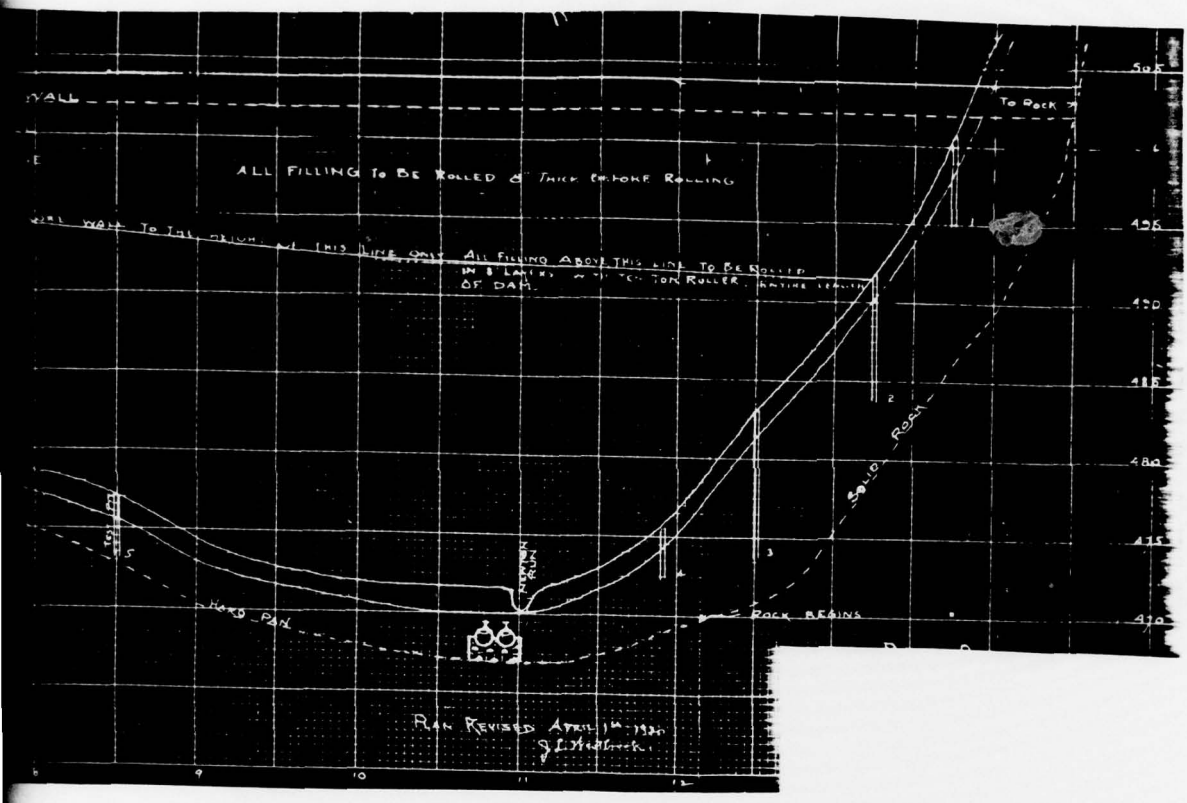
NAT.I.D.NO.PA.00636 MONROE COUNTY

DATA OBTAINED FROM J.L.WESTBROOK, CIVIL ENGINEER STROUDSBURG, PA., DATED AUGUST 1929

PLATE 3


CONCRETE WALLS 1' TOP 1 BOTTOM
CONCRETE CUT OFF 1' TOP 11' BOTTOM
NORMAL FLOW LINE
TO IMPERVIOUS MATERIAL
ORIGINAL SURFACE
CORE - WALL
TO IMPERVIOUS MATERIAL
12"
12"
NOTE: ALL SHEET PILING SAME AS SHOWN ON PLAN FOR 20' DAM APRIL 1929. HEIGHT TO BE INCREASED AS HERE SHOWN
AREA OF LAKE 60 ACRES +OR-
CAPACITY OF LAKE 30,679,000 GALLONS

2



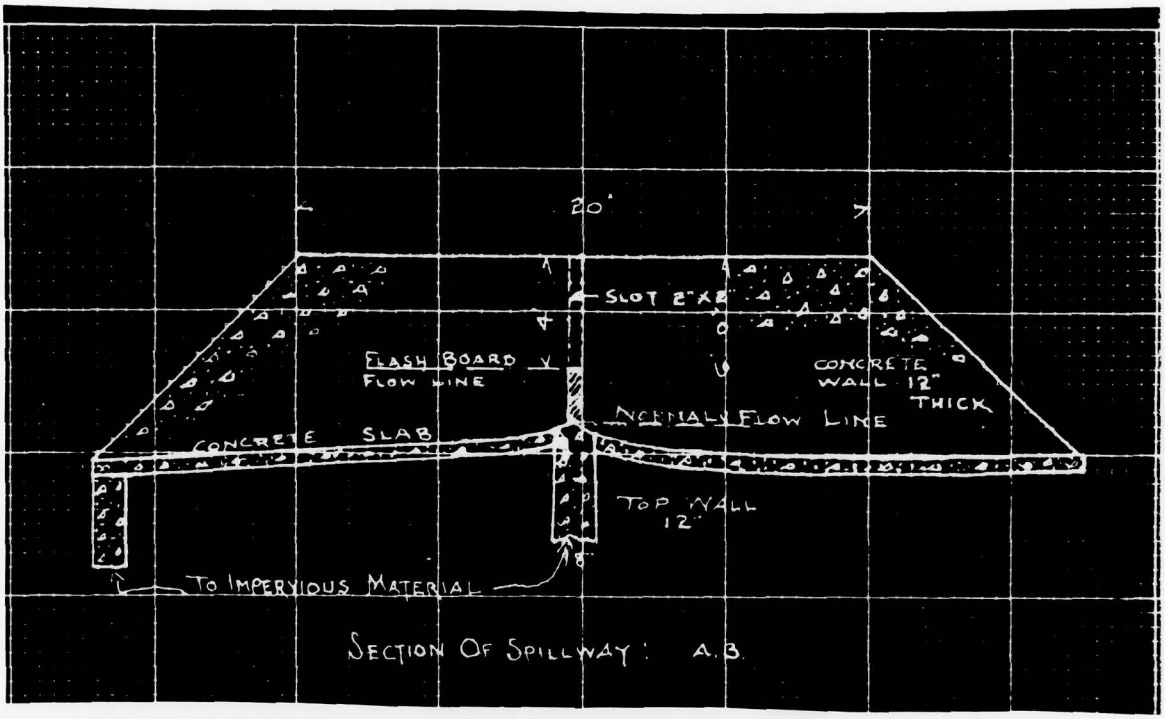
PROFILE ALONG EMBANKMENT AND POND DRAIN DETAILS

WHITE HERON LAKE DAM

NAT. I.D.NO. PA.00636 MONROE COUNTY

DATA OBTAINED FROMJ.L. WESTBROOK, CIVIL ENGINEER
STROUDSBURG, PA., DATED AUGUST 1929

PLATE 4



NOTE: FLASH BOARDS HAVE BEEN REPLACED
WITH A PERMANENT TRAPEZODIAL WEIR
TO ABOUT THE SAME ELEVATION

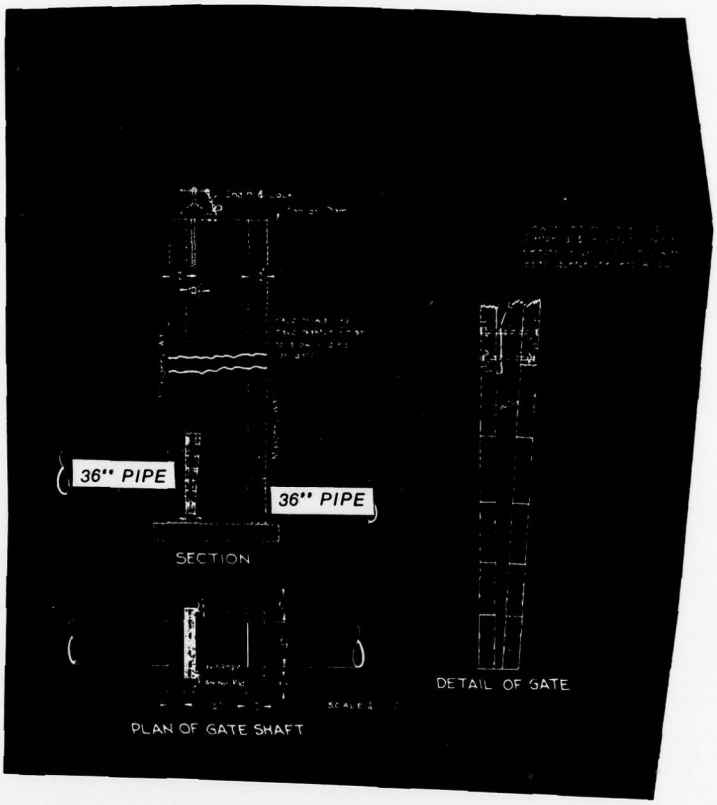
SPILLWAY PROFILE

WHITE HERON LAKE DAM

NAT. I.D.NO. PA.00636 MONROE COUNTY

DATA OBTAINED FROM J.L.WESTBROOK, CIVIL ENGINEER STROUDSBURG, PA. DATED AUGUST 1929

PLATE 5



NOTE: WOODEN SLUICE GATE CONVERTED TO A COLDWELL-WILCOX STEEL GATE

POND DRAIN INTAKE RISER
LAKE SWIFTWATER DAM

NAT.I.D.NO.PA.00776 MONROE COUNTY

DATA OBTAINED FROM GEORGE P. STOWITTS, CONSULTING ENGINEER, 1020 TEMPLE BAR BUILDING, CINCINNATI, OHIO, DRAWING DATED APRIL 14, 1928, CORRECTION FROM 1979 FIELD INSPECTION

PLATE 6

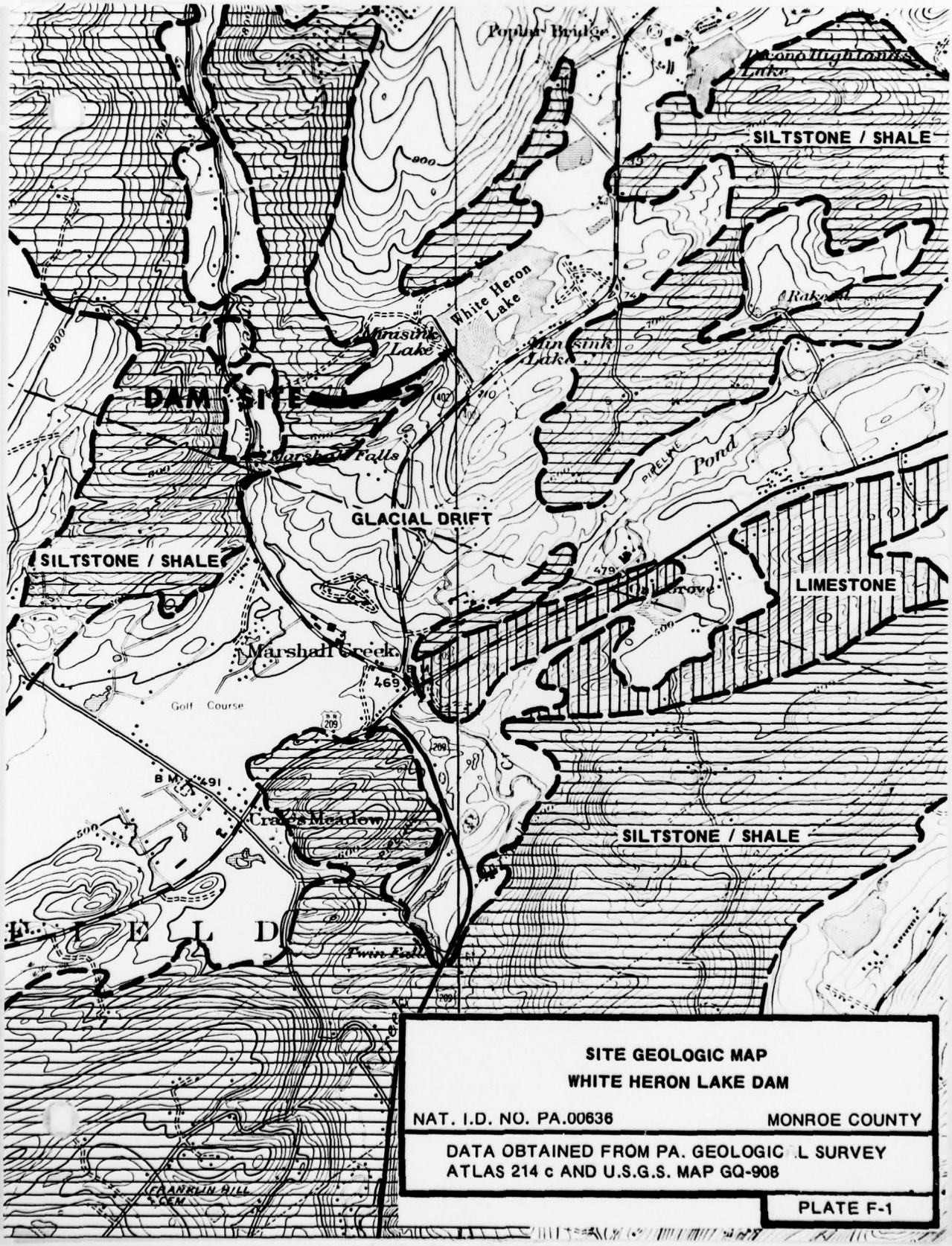
APPENDIX

F

SITE GEOLOGY
WHITE HERON DAM

White Heron Dam is located in the Glaciated Low Plateaus Section of the Appalachian Plateaus Physiographic Province. As shown on Plate F-1, the dam site and surrounding region, as is much of northeastern Pennsylvania, is underlain by Devonian age siltstone and shale formations. These formations are in part covered by a mantle of Wisconsin age glacial drift. The particular siltstone and shale units which underlie this dam site are referred to as the Mahantango Formation, which has a regional northeast strike with a slight to moderate dip to the northwest. Exposures of limestone occur to the south, but not in the vicinity of the dam site.

The soils upon which the dam is founded consist of the variable soil types encountered in glacial drift deposits. As reported in the State files, materials encountered during foundation excavation included clay, sand and gravel. In the right abutment area, bedrock was located from 6 to 10 feet below ground surface. The combination of relatively shallow bedrock and a glacial drift cover is a likely explanation for the spring encountered in the right abutment area during construction, which continues to contribute to the marshy area downstream adjacent to the dam toe, as observed during the course of the field inspection. The other areas of seepage observed, if not related internally to the dam itself, would not be unexpected considering the general nature of glacial soils.



SITE GEOLOGIC MAP
WHITE HERON LAKE DAM

NAT. I.D. NO. PA.00636 MONROE COUNTY

DATA OBTAINED FROM PA. GEOLOGIC L SURVEY
ATLAS 214 c AND U.S.G.S. MAP GQ-908

PLATE F-1